K-12 Pathways in Tennessee

Executive Summary

What is a high-quality pathway?

Departments of Education, policy experts, and in-state partners define key pathways experiences at the K-12 level as including the four key components:

- Career and technical education (CTE) programs of study
- Early postsecondary opportunities (EPSOs) aka college acceleration courses
- Industry credentials (ICs)
- Work-based learning (WBL)

It is believed that these four components provide students with the opportunity to explore, learn, and be ready for the next step after high school.

Why do high-quality pathways matter?

The four components of a high-quality pathway provide students the opportunity to get:

- Job-specific knowledge and skills (CTE programs of study)
- College credit in high school to save money and time towards a technical, associate or bachelors degree (College acceleration courses)
- Third-party verification of gaining the knowledge or skill (Industry credentials (ICs))- often CTE specific
- Hands-on experience in occupations and development of employability skills (work-based learning)

But up until this point no one had looked at the data to see what was happening on the ground. How do students combine different experiences? How does it vary by student demographics or region? And if students are in CTE programs, is there alignment to careers that are setting them up for success (high-wage, high-demand, high-skill careers)?

About the Research

Excel*in*Ed worked with the University of Tennessee Knoxville to dig into these questions:

1. How are students combining pathways experiences, such as CTE programs of study, early postsecondary opportunities (EPSOs aka college credit in high school), industry certifications and work-based learning?
   - Are there differences across CTE programs of study?
2. Which students have access to—and progress through—different CTE programs of study?
   - Are there differences across regions and student groups?
3. How does each CTE program of study align with in-demand, high-wage career opportunities (statewide and by region)?
   - Do existing CTE programs lead to the best career opportunities in students' communities? Where are there opportunities?

You can dig into the full reports here and here.

Tennessee Context

This research looks at the experiences of Tennessee 12th graders from 2019-2023. During that time—and since—the state has made numerous efforts to strengthen pathways experiences:

- Formalization of TNWorks, the cross-agency partnership focused on aligning pathways and services across systems to support all success for all Tennesseans.
- Launch of the FutureReadyTN Initiative focused on 4 pillars:
  - Credentials of Value, Seamless Transitions, Individualized Advising, and Work-Based Learning
- New funding and accountability structures that incentivize aligned CTE programs and pathways experiences
  - TISA: Direct CTE (Tiered) Funding and High School Outcomes Bonus Funding
  - A-F School Grades (College and Career Readiness indicator)
- Infusion of one-time, pathways-specific funding through Innovative School Models

The data below provides a baseline of students' pathway experiences that can be used to identify opportunities and measure progress. And while we analyzed this data for Tennessee, the trends presented are trends we anticipate any state would see.

Key Terms and Data Notes

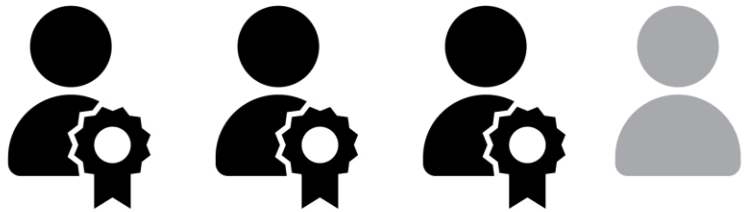
- **Students**: All high school seniors (12th graders) in 2019-20, 2020-21, 2021-22, 2022-23.
  - **CTE-Focused**: took at least 3 courses in one of the 50+ CTE programs of study identified by TDOE
  - **Other Students:** did not take 3 or more courses in the same CTE program of study.
- **Pathways Experiences Access and Participation:** students are 'counted' as having the experiences below if, during high school, they:
  - **Early postsecondary opportunity (EPSO)**: *attempted to earn* college credit in high school by *sitting for* an AP, IB, or CLEP exam and/or *enrolling in* a dual enrollment or statewide dual credit course.
    - EPSO participation and success data are getting stronger for more recent cohorts.
  - **Industry credential (IC)**: earned one or more credentials on the TDOE Promoted Industry Credential list
  - **Work-based learning (WBL):** enrolled in a capstone WBL course as identified by TDOE
- **CTE Program Alignment:** As a proxy for alignment to employer opportunities, we used Tennessee's funding formula Tennessee Investment in Student Achievement (TISA) which was implemented after this data.
  - CTE programs are funded on a scale of 1, 2, or 3.
  - Level 3 programs are most aligned to high-wage, high-demand and high skill jobs.
  - Level 1 programs are least aligned to high-wage, high-demand and high-skill jobs.
  - Note: TISA CTE Funding Levels were implemented after these cohorts, but they are included for context.

Complete definitions and methodology can be found in the full reports here and here.

Takeaways by Pathways Experiences Combinations

CTE-focused students are more likely to participate in—and combine—different pathways experiences than other students, which makes sense. But there are wide variations across CTE programs and a huge opportunity to increase all students' access to some/or all pathways experiences.

- About 25% of all students leave high school without attempting college credit, earning an industry credential, or gaining real-world experience through WBL.
- CTE-focused students and other students combine EPSOs, ICs, and WBL to different degrees.
  - The largest share participate in just one type (EPSO or IC or WBL) – 41% of CTE-focused and 53% of other students.
  - 30% of CTE-focused students and 15% of other students combine two types. EPSO and WBL is the most popular combination.
  - 10% of CTE-focused students and 3% of other students combine all three types.
- 5% of all students combine all four pathways experiences (CTE + EPSO + IC + WBL).



But this is not just about getting more students to participate in more experiences. Additional data is needed to understand experience quality, student success, and which combinations lead to each of Tennessee's most promising careers.

Key Takeaways by Pathway Experience: CTE

More students are progressing through CTE programs, starting before TISA.

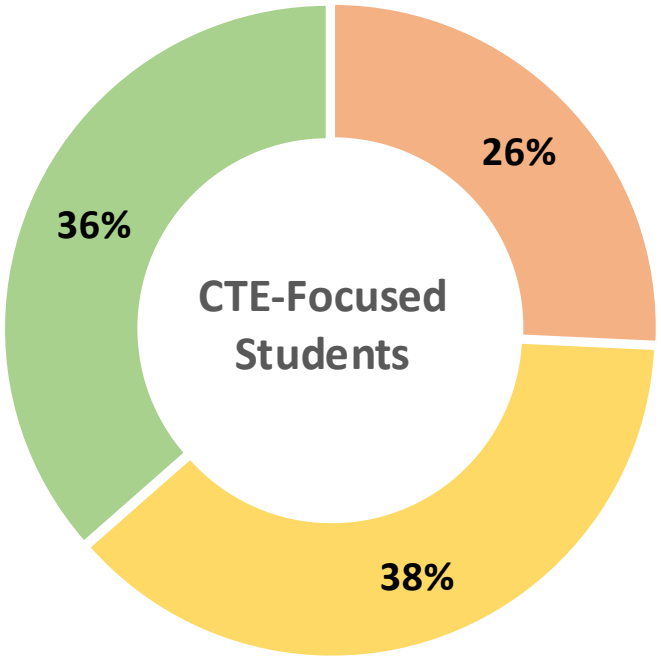
- Almost half (49%) of the class of 2023 is CTE-focused, which is up from 43% in 2020.
- Students have the most access to low-value programs but engage most in higher-value ones.

WHAT POLICYMAKERS NEED TO KNOW:

Student interest and engagement in CTE programs is growing, but not all CTE programs offer students the same value in terms of job demand and wages. Continue to analyze and adjust TISA funding levels (and other CTE-related policies) to ensure CTE programs offer students the best opportunities for success in their communities.

Takeaways by Experience: CTE

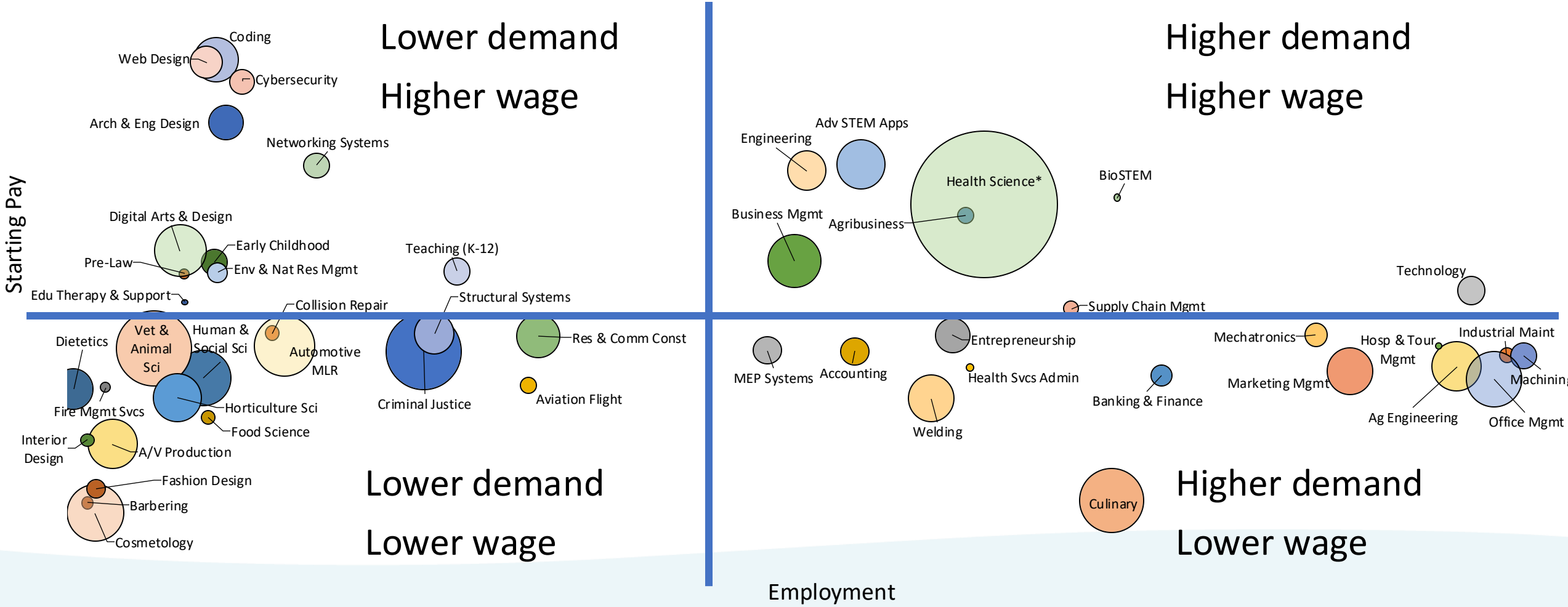
Across the 50+ CTE programs, CTE-focused student engagement is not consistently aligned with programs that lead to the highest-wage, in-demand jobs.



- **33%** of CTE-focused students are in the 10 programs that lead to the **highest-wage jobs**. Most of these are Health Science*.
- **11%** of CTE-focused students are in the 10 programs that lead to jobs with the **highest employer demand**.
- **61%** of CTE-focused students are in the **10 largest programs**.
- **26%** of CTE-focused students are in programs aligned with **lower-wage jobs**.

CTE Program Engagement, Demand and Wages

Opportunity remains to support students in entering higher demand, higher wage programs.



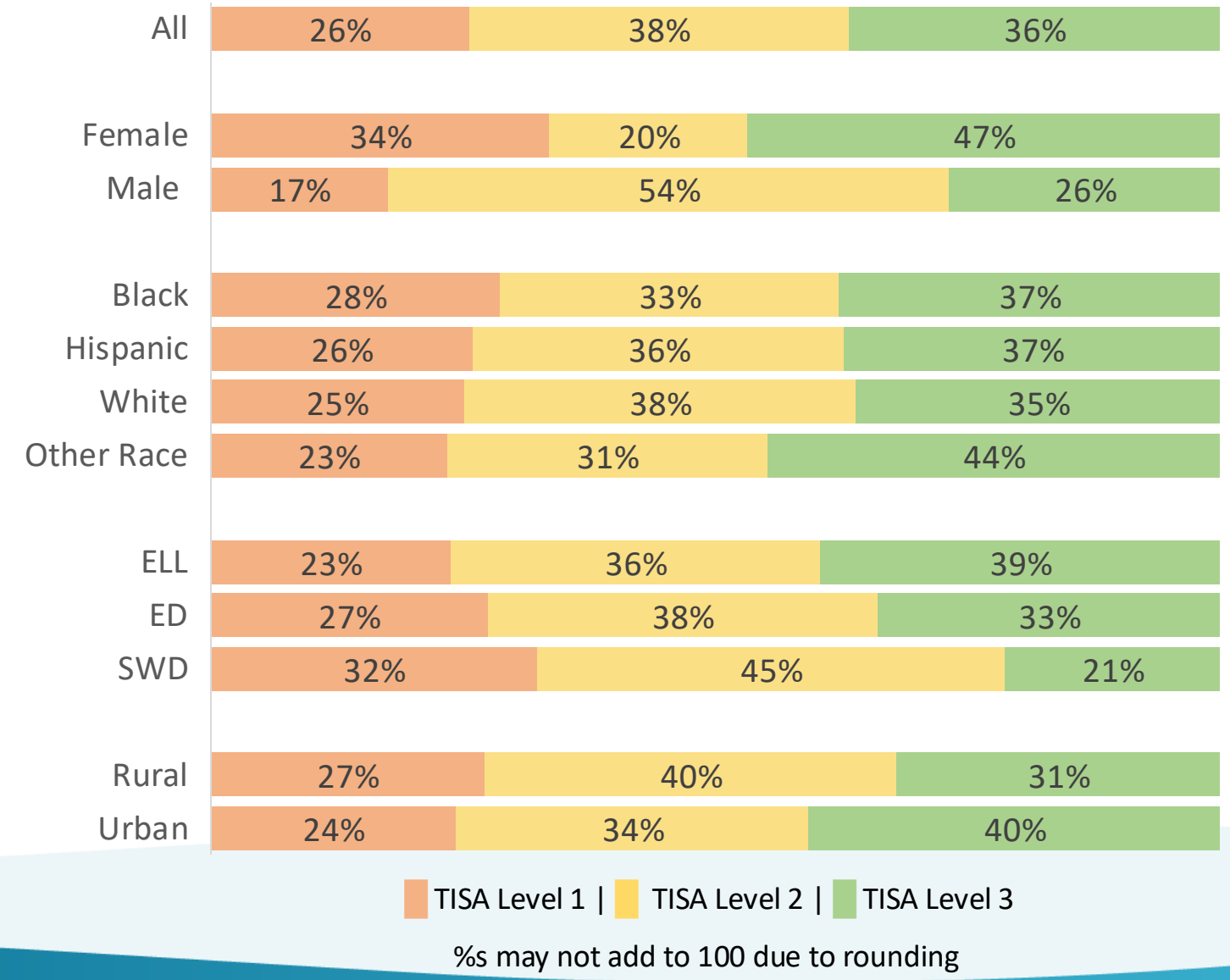
The size of each bubble reflects the share of CTE-focused students

Takeaways by Student Groups: CTE-focused

CTE-focused student engagement varies by student groups across the three TISA funding levels.

- The gender gaps are the largest, with female students overrepresented in the extremes and 'middling' males.
- CTE-focused students in urban counties are more likely to engage in TISA Level 3 programs
- Economically disadvantaged students are underrepresented in TISA Level 3 programs.
- Just 1 in 5 CTE-focused students with disabilities engages in a TISA Level 3 program.

***Data Note**: this chart displays student group data for 37 CTE programs. 14 smaller CTE programs are not included due to data suppression rules.*



%s may not add to 100 due to rounding

Takeaways by Region: CTE focused

- Advanced Manufacturing programs are very undersupplied.
  - Around Blue Oval City (Southwest), Welding accounts for just 1.1% of the region's CTE-focused students—and the 3 other advanced manufacturing programs of study either are not available or have very few CTE-focused students.
- Veterinary & Animal Science is oversupplied in all regions.
  - It makes up just 0.3% of jobs statewide, but it is a large share of CTE-focused students in Upper Cumberland (15.3%) and Northwest (14.8%).
- Health Science* appears very oversupplied in all regions.
  - It aligns with 3.8% of jobs statewide, but it is by far the largest in terms of CTE-focused students, ranging from 17% in Upper Cumberland to 33.4% in Northwest.

* due to significant overlap in courses, this research combines all 5 Health Science programs into a single CTE program of study

Takeaways by Pathway Experience: College Acceleration

Early Postsecondary Opportunities (EPSOs) are skyrocketing for all students.

- Most students take at least one EPSO (68% of CTE focused and 65% of other students)
- But CTE-focused students engage in EPSOs at a lower rate than others (2.23 vs. 2.66 EPSOs/student).
- And gaps are even wider across regions and programs. For example:
  - 1.79 EPSOs/student: CTE-focused students in Northern Middle
  - 3.91 EPSOs/student: Other students in Upper Cumberland

WHAT POLICYMAKERS NEED TO KNOW:

The state's investments in EPSOs are showing results. Future EPSO policies should focus on ensuring every student has access to intentional pathways that include (or combine) CTE and EPSOs.

Takeaways by Pathway Experience: Industry Credentials

Industry Credentials are the smallest experience.

- 28% of CTE-focused and 11% of other students earn an industry credential.
- Almost half of the ICs earned are Tier 1 (lowest).
- The top 5 programs for higher-level ICs earned are all TISA Level 2.

WHAT POLICYMAKERS NEED TO KNOW:

Meaningful industry credentials are available to students. While attainment is growing, many students are earning lower-value credentials. Future industry credential policies should leverage and strengthen messaging of the credential tiers.

Takeaways by Pathway Experience: Work-based learning

Work-Based Learning is growing, but gaps remain.

- 34% of CTE-focused and 17% of other students take at least one WBL course.
- Only 4 programs (out of 50+) average more than one WBL experience per student.
- And in 40 programs, the average is less than 0.5 (or less than half of CTE-focused students).

WHAT POLICYMAKERS NEED TO KNOW:

Interest and engagement in WBL are increasing. Future WBL policies should support increased access (especially for non-CTE focused students), sustained industry engagement, and expanded quality and success metrics for WBL experiences (beyond participation).

Opportunities for All States: Strengthen the System



Leverage the *Pathways Matter* framework of policies

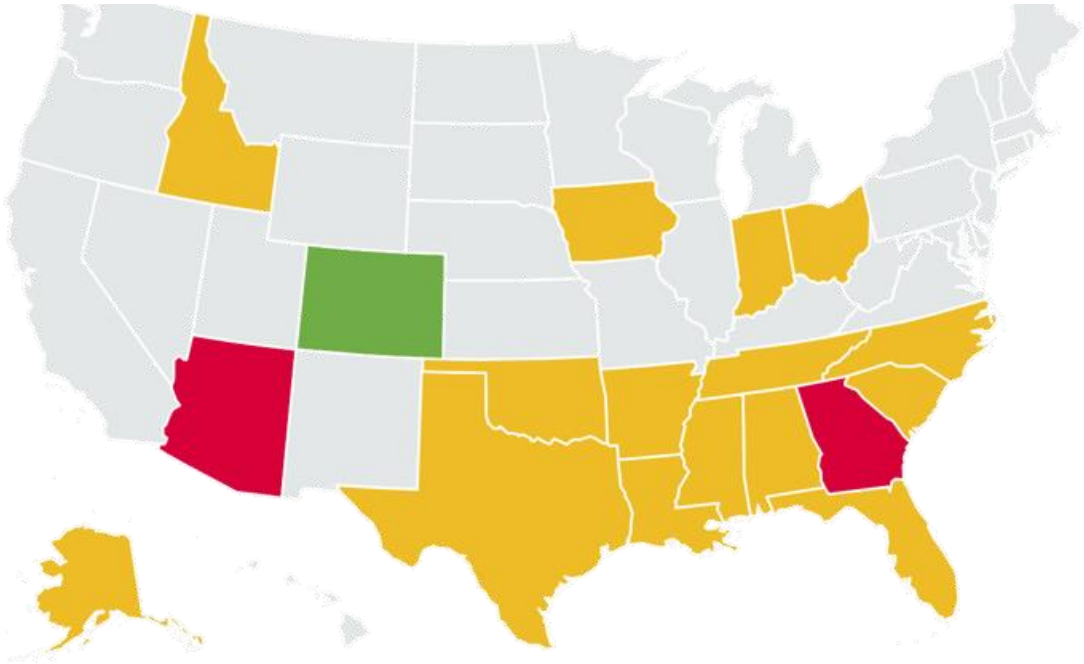
Key Action: Conduct an ROI Analysis and use the data to:

Transparency	Structural	Incentives
Provide transparent information to high school students before they make decisions on their high school courses, postsecondary options, and career aspirations. **Provide transparent information to schools and districts** so they can evaluate and make changes or improvements to their existing programs—especially those with weak outcomes.	**Create new or expand existing K-12 CTE programs** that align with high-demand, higher-wage, higher-skill occupations. **Eliminate K-12 programs with low enrollment** or graduate numbers (e.g., <10 students). **Allocate supplemental startup funding** to launch or expand programs, with amounts tied to those with strongest projected outcomes.	**Implement outcomes-based funding** based on success of students within six months of graduation (employment, enrollment, or enlistment), with higher amounts for higher-need students (e.g., low-income). **Provide tiered/weighted funding** based on alignment to high-demand, higher-wage, higher-skill occupations, with greater amounts of funding for programs with strong alignment. Use incentive funding to drive program improvement instead of applying uniform funding cuts.

Engage with Pathways Matter to see where gaps exist across the 4 pathways experiences.

- Work-based Learning
- Career and Technical Education
- Industry Credentials
- College Acceleration (EPSOs)

State Map: Work-based learning continuum



Data Deep Dive

CTE Program Access: What is offered in schools?

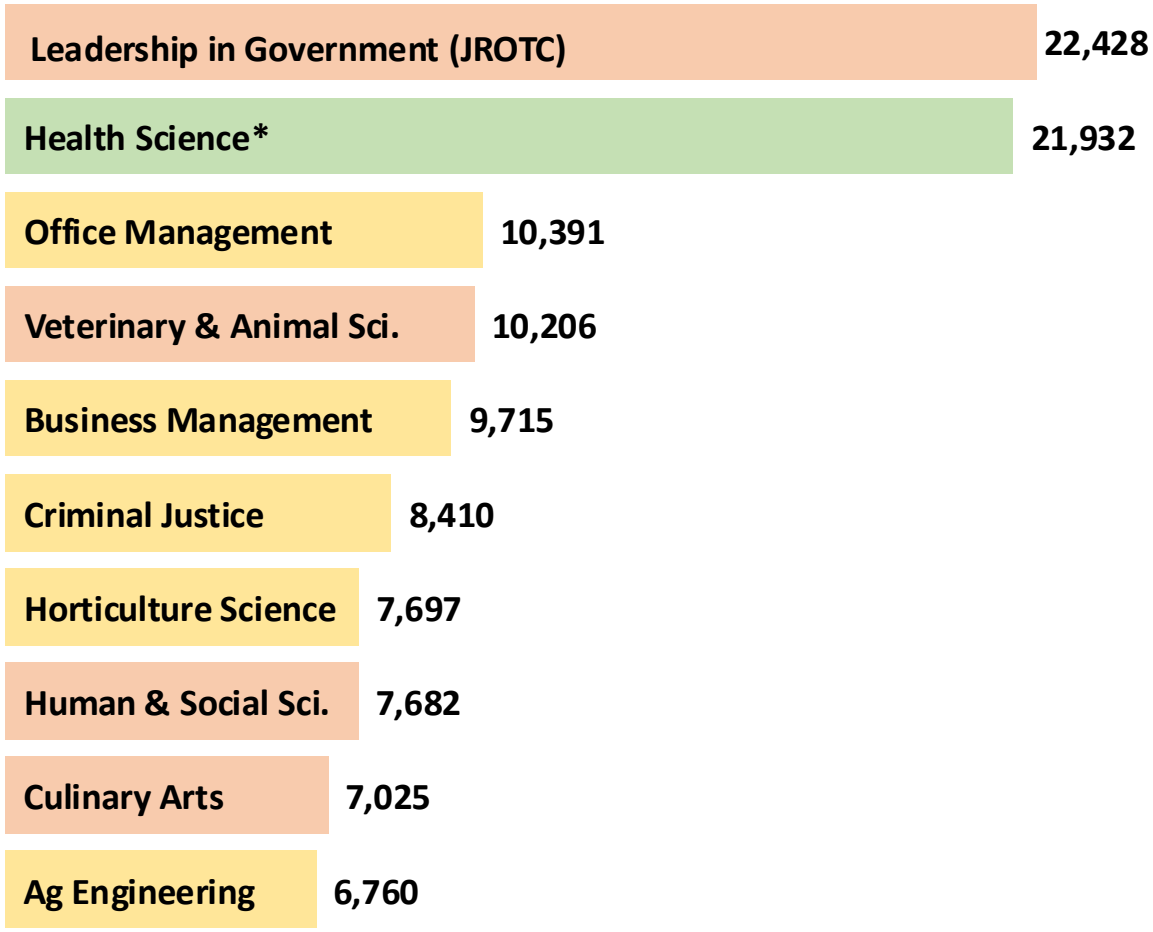
Students have the most access to CTE programs that are TISA Level 1 (lowest level)

- Just 1 of the top 10 programs in terms of student access is highest-rated (TISA Funding Level 3).
- Roughly one in three 12th graders have access to Health Science* and JROTC program(s), but just 2.5% of seniors attend schools where Mechatronics is offered.

Tennessee has a huge opportunity to increase student access to higher-rated CTE programs.

Definition: students have access to a CTE program if they are enrolled in a school where students take Level 1, Level 2, and Level 3 courses during their senior year.

Top-10: Most Available CTE Programs
(average annual student access)



CTE Program Engagement: What do students actually take?

More and more students are progressing through CTE programs of study (3+ courses).

- Almost half (49%) of the class of 2023 is CTE-focused, which is up from 43% in 2020.
- But four of the 10 most popular CTE programs are the lowest-rated (TISA Level 1) and are aligned with occupations that have low starting pay.
- Five of the 10 most popular CTE programs are also among the fastest-growing—but only Health Science* is highest-rated (TISA Level 3).

Top 10: Largest CTE Programs
(average annual CTE-focused students)

Program of Study	Students	Starting Pay
*Health Science**	*8,135⁺*	*$55,117*
Criminal Justice	*2,161⁺*	*$40,444*
Vet. & Animal Science	*2,085⁺*	*$40,700*
Culinary Arts	*1,513⁺*	*$25,588*
Automotive MLR	1,357	$40,989
Cosmetology	1,154	$24,321
Office Management	1,134	$37,652
Human and Social Sciences	1,119	$37,805
Business Management	*1,035⁺*	*$49,408*
Digital Arts & Design	973	$50,482

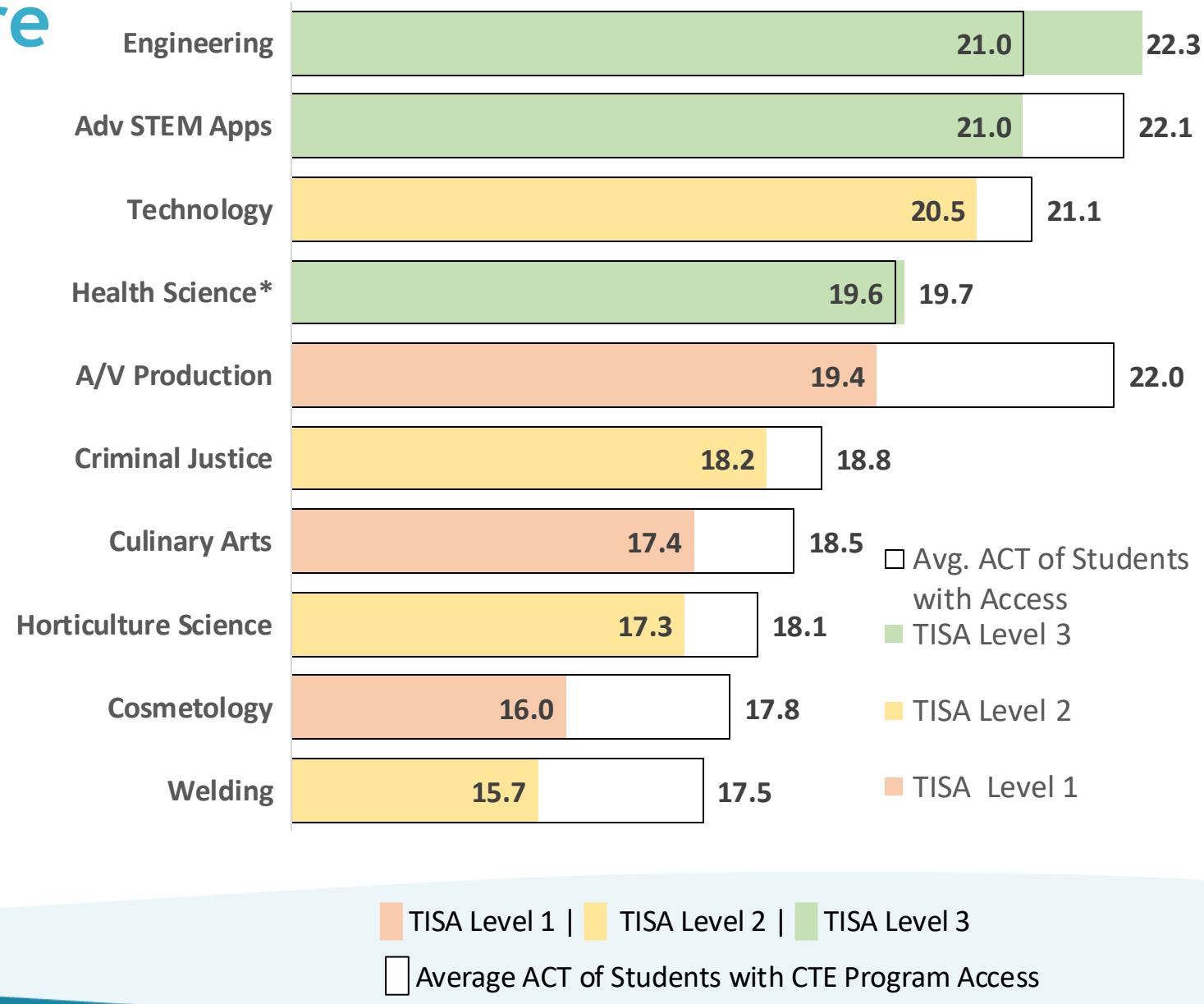
TISA Level 1 | TISA Level 2 | TISA Level 3 | ⁺ *Top 10 Fastest-Growing Programs*

CTE Programs: What are ACT trends?

Access Across Schools
The highest-rated programs are available at schools with higher ACT scores (max 36).

Participation Within Schools
For most programs, CTE-focused students have lower average ACT than their classmates.

Definition: students have access to a CTE program if they are enrolled in a school where students take Level 1, Level 2, and Level 3 courses during their senior year.



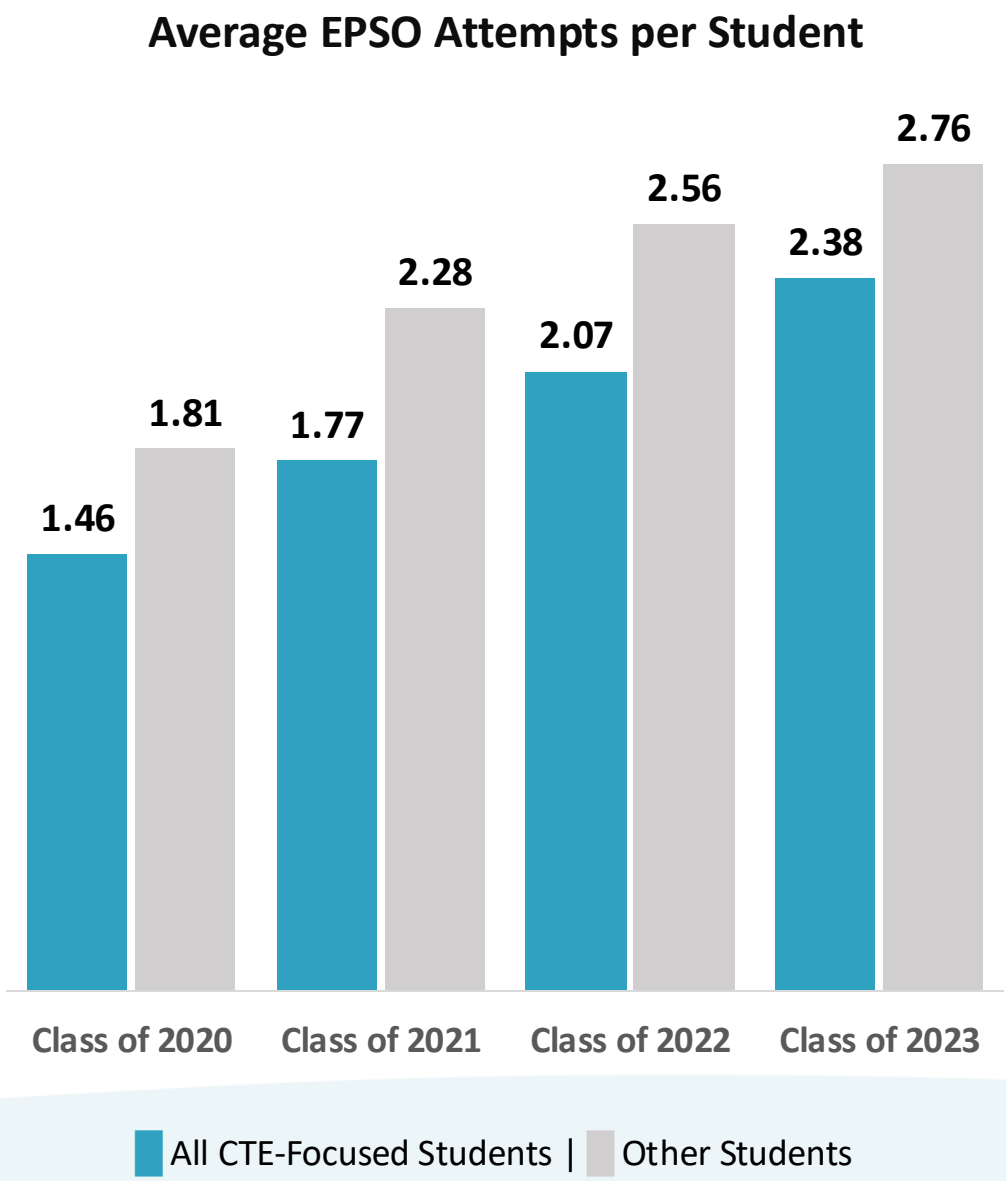
EPSOs: How many are students taking?

Early Postsecondary Opportunities (EPSOs) are skyrocketing and increasing for both CTE-focused students and other students.

But CTE-focused students engage in EPSOs at a lower rate than other students.

For the class of 2023, CTE-focused students took just over 2 EPSOs each, compared to other students who took almost 3.

This shows that the "college OR careers" preparation too often persists.



EPSOs: What are the regional trends?

The depth of EPSO engagement *and* the gap between CTE-focused students and other students varies widely across regions.

Regional Takeaways

- **Upper Cumberland** has the highest EPSO attempts for both CTE-focused students (~3) and for other students (~4).
  - But also has the largest gap (almost 1).
- **Northern Middle** has the lowest rate for CTE-focused students and one of the largest gaps.
- **Greater Memphis** is the only region where CTE-focused students attempt (*slightly)* more EPSOs than other students.

EPSO Attempts per Student, Class of 2023

	CTE-Focused	Other Students	Gap
Upper Cumberland	3.05	3.91	-0.86
Northeast	2.90	2.99	-0.09
Northwest	2.83	2.89	-0.06
Greater Memphis	2.83	2.80	0.03
East	2.69	2.77	-0.08
Southeast	2.47	2.98	-0.51
Statewide	**2.38**	**2.76**	**-0.38**
Southwest	2.21	2.69	-0.48
Southern Middle	2.18	2.41	-0.23
Northern Middle	1.79	2.53	-0.74

EPSOs: What are the trends by CTE program?

Students have the highest EPSO attempts in CTE programs that are TISA Level 3 or Level 2, compared to the lowest rate of EPSO attempts which can be found in personal services- and construction-related programs.

Students in the Agribusiness, Technology and Advanced STEM Applications programs engage in, on average, almost 4 EPSOs. Compared to Structural Systems and MEP Systems (both construction) where students attempt about 1.

- This puts construction students at a disadvantage if they want pursue a postsecondary credential at a TCAT or community college.

EPSO Attempts per Student

Top 5	Agribusiness	3.83
	Technology	3.70
	Advanced STEM Apps	3.63
	Engineering	3.43
	Cybersecurity	3.23
	Other Students	**2.66**
	All CTE-Focused Students	**2.23**
Bottom 5	Digital Arts & Design	1.45
	Cosmetology	1.31
	MEP Systems (Construction)	1.28
	Structural Sys. (Construction)	1.27
	Barbering	1.07

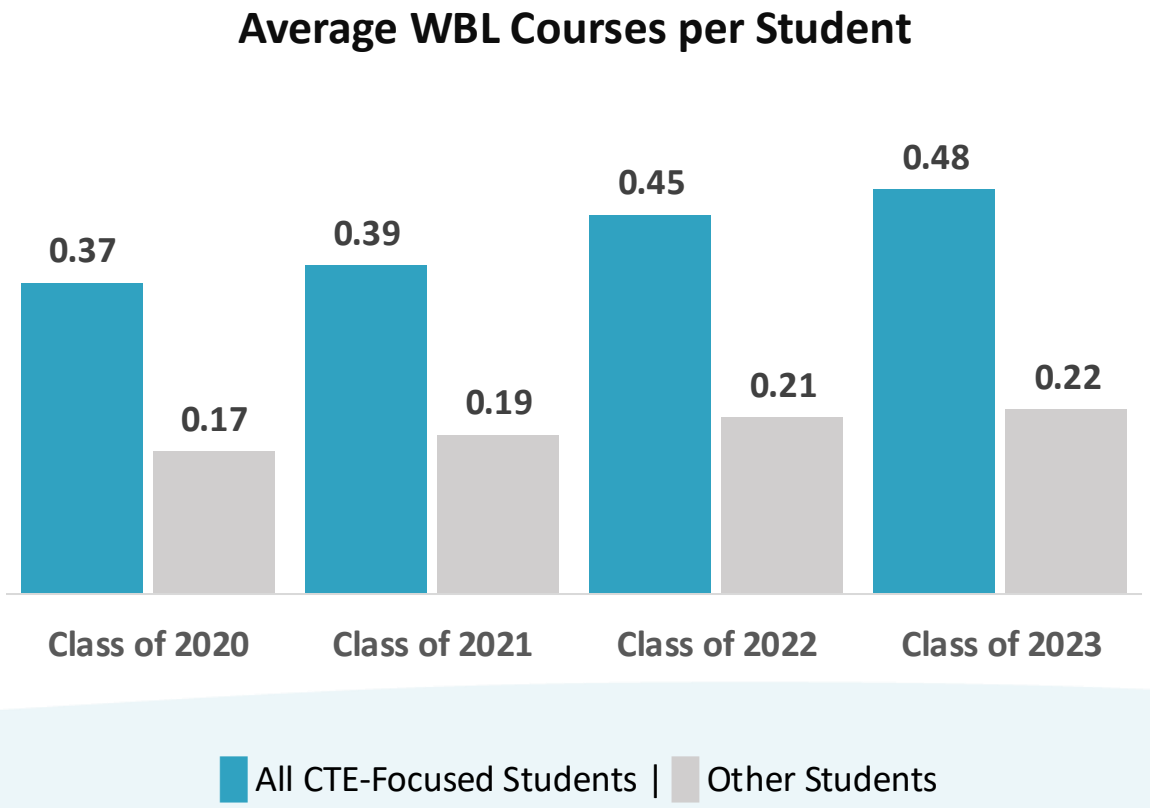
TISA Level 1 | TISA Level 2 | TISA Level 3

Work-Based Learning: How many are students taking?

Work-based learning (WBL) is on the rise. Students who are more engaged in CTE take more than twice as many WBL courses—but participation is still low across the state and regionally. WBL is valuable for ALL learners, not just CTE-focused students and not just certain groups or programs. This is a huge growth opportunity.

Regional Takeaways

- **Southeast** has the highest WBL for CTE-focused students at .65 (each student takes less than one WBL experience) and also the highest gap when compared to other students.
- **Greater Memphis** and **Southwest** have the lowest rates of WBL: about 3 in 10 CTE-focused students, and 1-2 in 10 other students have a WBL experience in those regions.



WBL: What are the trends by CTE program?

WBL can provide valuable opportunities for all students to get "real-world" experience, engage with employers and see if that career path is a good fit.

The drop in WBL experiences across the top 5 programs is stark. Only 4 programs (out of 50+) average more than 1 WBL experience per CTE-focused student. And for interior design it's just 1 in 5 students.

It's also notable that the top 5 programs for WBL are in agriculture- and education-related fields, which may indicate challenges in creating WBL opportunities in other industries and the need to think about WBL in "non-traditional" areas.

There's tremendous opportunity to rethink who has access to WBL.

WBL per Student

Top 5	Early Childhood Edu Careers	3.78
	Agribusiness	1.90
	Food Science	1.79
	Env. & Nat. Res. Mgmt	1.52
	Teaching as a Profession (K-12)	0.90
	All CTE-Focused Students	**0.46**
	Other Students	**0.22**
Bottom 5	Networking Systems	0.22
	Industrial Maintenance Tech	0.21
	Interior Design	0.20
	Auto Collision Repair	0.19
	Barbering	0.10

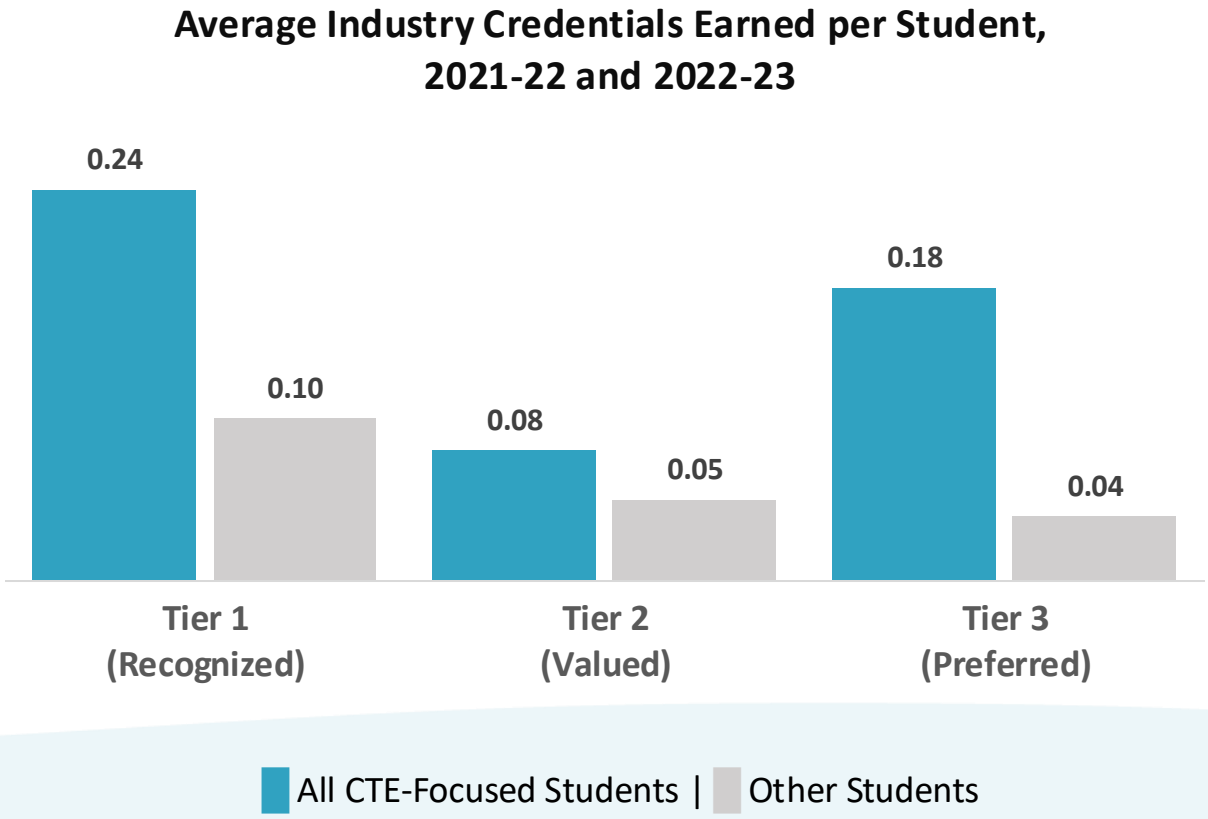
TISA Level 1 | TISA Level 2 | TISA Level 3

Industry Credentials: How many are students earning?

Students who are more engaged in CTE earn more **industry credentials** than other students. Which makes sense because not all CTE programs or students need to earn an industry credential. But the credentials that students earn are not always aligned with the highest demand, skill and wage career opportunities.

Regional Takeaways

- **Upper Cumberland** has the highest overall rate of industry credential attainment for CTE-focused (.63) and other students (.39)
- **East** has the highest rate of Tier 2/Tier 3 industry credentials (.33)
- **Southwest** has the lowest Tier 2/Tier 3 attainment for CTE-focused (.15) and other students (.05)



Industry Credentials: What are the trends by CTE program?

Not all industry credentials are created equal but even for the CTE programs that have meaningful industry certifications, those are not the ones being earned.

All of the top 5 CTE programs for higher-level industry certifications earned are TISA Level 2.

Dive Deeper

A detailed look at the alignment of industry credentials with employer demand across the state's K-12 and postsecondary systems can be found in Tennessee Industry Credentials Analysis. (ExcelinEd and Lightcast, 2024).

Tier 2-3 ICs per Student

Top 5	Accounting	0.36
	Technology	0.35
	Entrepreneurship	0.33
	Automotive MLR	0.31
	Welding	0.31
	All CTE-Focused Students	**0.21**
	Other Students	**0.07**
Bottom 5	Fashion Design	.09
	Criminal Justice & Corrections	.06
	Teaching as a Profession (K-12)	.03
	Interior Design	*
	Barbering	*

TISA Level 1 | TISA Level 2 | TISA Level 3

Pathway Experiences: Participation and Combinations

CTE-focused students are more likely to participate in—and combine—different pathways experiences than other students. But there are wide variations across CTE programs.

- About 25% of all students leave high school without attempting college credit, earning an industry credential, or gaining real-world experience through WBL.
- CTE-focused students and other students combine EPSOs, ICs, and WBL to different degrees.
  - The largest share participate in just one type (EPSO or IC or WBL) – 41% of CTE-focused and 53% of other students.
  - 30% of CTE-focused and 15% of other students combine two types. EPSO and WBL is the most popular combination.
  - 10% of CTE-focused and 3% of other students combine all three types.
- 5% of all students combine all four experiences (CTE+ EPSO+ IC+ WBL).

But this is not just about getting more students to participate in more experiences. Additional data is needed to understand experience quality, student success, and which combinations lead to Tennessee's most promising careers.

Students' Pathway Experiences

(High School Seniors, 2021-22 and 2022-23)

	CTE-Focused (49% of all)	Other (51% of all)
Students Combining Experiences	**40%**	**18%**
EPSO and WBL and IC	10%	3%
EPSO and IC	11%	5%
EPSO and WBL	16%	10%
WBL and IC	3%	0%
Students with No Combinations	**60%**	**82%**
Only One Type (EPSO or IC or WBL)	41%	53%
None of the above	19%	29%
Experience Participation (Students may be counted in multiple rows)		
Early Postsecondary Opportunity (EPSO)	68%	65%
Industry Credential (IC)	28%	11%
Work-Based Learning (WBL)	34%	17%

Tennessee Recommendations

Tennessee Opportunities

Now: Expand **Statewide Articulation Agreements** that help students stack experiences toward a valued credential across K-12 and postsecondary systems.

- ***College Core Credential*** establishes common set of EPSOs that are uniformly accepted at all postsecondary institutions toward general education requirements.
- ***Industry Certification Articulation*** ensures students are aware of—and receive—consistent postsecondary credits/hours across postsecondary institutions.

Short Term: Strengthen and consolidate existing reports into a comprehensive **ROI Analysis policy** that spans K-12 and postsecondary.

- Connect students' pathways experiences with longer-term outcomes (postsecondary enrollment, employment, wages, enlistment).
- Make program offering and funding decisions based on the results.
- Report this data by institution and program to support student advising and decision-making.

Longer Term: Along with TNWorks partners, adopt a cross-agency **Credentials of Value policy** that tiers all postsecondary awards and industry certifications based on their alignment to high-wage, in-demand jobs.

- Align all pathways-related definitions, criteria, and lists used for funding, accountability, etc. to the COV policy.

Tennessee Opportunities: K-12 Pathways Data

	EPSO	CTE	WBL	Industry Credentials
Existing Data	**EPSO course code enrollment** **Assessment participation and scores** for *some* exam-based EPSOs (e.g., AP)	**CTE course code enrollment** **CTE concentrator status** (2+ courses in a CTE program)	**Capstone WBL course code enrollment** (by program of study)	**Industry Credentials earned** (often self-reported)
Critical Data Gaps (Student-Level)	**Earned postsecondary credits/hours** for each EPSO experience **Earned EPSO credits/hours awarded** toward major or general education requirements **Postsecondary credential attainment** during high school.	**Student progression** (number of courses) in each CTE program of study **Student grades and credits** (K-12 and/or postsecondary)	**Capstone WBL experience quality,** including: • type (location, paid/unpaid) • alignment with prior courses and future goals, • measures of student success.	**Industry credential attempts,** including failures (and aggregated pass rates) **Industry credential attainment within a CTE program of study** (and which program)
Other Information Gaps	**EPSOs offered** by each school and district (including postsecondary partnerships)	**CTE programs offered** by each school/district **Aligned occupations for each CTE program** for TISA funding, C3R, etc.	**Employers and industries** offering WBL experiences. **Non-credit WBL experiences** (offerings and participation)	**Aligned occupations** for each industry credential. **TN Employers** that use each industry credential.
	Post-High School Outcomes: postsecondary enrollment and completion, employment, wages **Enhanced UI Wage Data:** provides clearer insights into alignment between each student's experiences and their ultimate employment			

CTE Pathways in Tennessee: Full Reports

Authors: Celeste Carruthers, Seth Neller, Walter Ecton

Published May 2026

CTE Pathways in Tennessee:
Program Access, Engagement, and Labor Market Alignment

CTE Pathways in Tennessee:
Early Postsecondary Opportunities, Work-based Learning, and Industry Credentials